

**REMARKS**

The Office Action makes a restriction requirement, dividing original claims 1 - 33 into Groups I (claims 1 - 17), II (claims 18 - 27) and III (claims 28 - 33). The claims of Group II were elected for prosecution, with traverse of the restriction requirement, in a telephone interview with the undersigned. The Group II claims were then rejected under 35 USC § 102(b) as anticipated by Busch patent 5,473,162.

Although the election of the Group II claims is affirmed hereby, the restriction requirement is again traversed, and reconsideration is respectfully requested. As noted by the Examiner, the Group I claims are drawn to an apparatus for measuring the total organic carbon content of a solution (TOC), and those of Group II to a process for doing so; the Examiner's argument for restriction between Groups I and II is that the Group I apparatus can also be used to practice a different method, that of measuring the total organic carbon content of a solution (TIC), which is the subject matter of Group III. The difference in the methods of Groups II and III is the basis for the restriction requirement therebetween.

Although it cannot be gainsaid that the claims can indeed be grouped as the Examiner has done, it is earnestly submitted that the restriction requirement should still be withdrawn. Specifically, it would not be possible to meaningfully examine the method of the claims of Group II without searching for the apparatus of the claims of Group I, since the operative limitations thereof are substantially identical. For example, suppose there had been a prior patent application with identical claims, which had been subjected to a similar restriction requirement; suppose further that the prior applicant had elected the apparatus claims, had his patent issued and not prosecuted a divisional application to the method. Unless the present

Examiner searches for apparatus patents, the present applicant having elected the method claims, that prior patent will never be located and applied, despite being (hypothetically) anticipatory prior art. Hence a search for patents having apparatus claims is necessary here for a proper search to be accomplished, such that the Examiner need do little extra to examine the Group I and II claims in one application. Similarly, the Group III claims are very closely related to the Group II claims, particularly inasmuch as claims 32 and 33 effectively add the Group II method of measuring TOC to the method of measuring TIC of group III.

Turning now to the substantive rejection of the group II claims (the arguments presented below being essentially applicable to groups I and III as well), as noted Busch patent 5,473,162 was applied to make a 35 USC §102 anticipation rejection. This is respectfully traversed. In essence, the present claims require that the plasma serve as the source of energy to oxidize TOC in a water sample to CO<sub>2</sub> for subsequent analysis; Busch teaches using the plasma to excite CO<sub>2</sub> atoms, having been formed by oxidation of TOC by other means, for IR analysis.

More specifically, although Busch does teach measuring TOC by oxidizing the TOC and then measuring the CO<sub>2</sub> thus formed (see col. 15, line 66 - col. 16, line 20) the methods for oxidation are to be "the same methods currently used...: chemical methods such as the use of peroxydisulfate, heating such as in a furnace with copper oxide and the use of UV radiation" (col. 16, lines 14 - 19.) Further, if a flame is used to excite the molecules for IR emission detection, "the sample can be combusted directly in the flame to generate CO<sub>2</sub>." Col. 16, lines 21 - 24.

By comparison, claim 18 recites the steps of admitting a sample of water the TOC of which is to be measured, and a CO<sub>2</sub>-free oxidant gas to a cell, and applying a high-frequency, high-

voltage signal across electrodes on opposite sides of the cell, "so as to cause a plasma to form across said electrodes, and TOC in said sample to be oxidized to CO<sub>2</sub>". Thus it is clear that claim 18 explicitly recites that it is the plasma that drives oxidation of the TOC to CO<sub>2</sub> for subsequent analysis. Claims 1 and 28 include essentially similar limitations, so that this important aspect of the invention is included in all of the present claims, again supporting applicants' point that restriction is not appropriate in this case.

Busch discusses the use of plasmas under the heading "Infrared Emission Spectroscopy Based on Electrical Excitation", beginning on col. 57, line 49. As the heading suggests, the plasma is used as above to excite the atoms to be analyzed, so that they emit a characteristic IR spectrum for analysis; no suggestion of use of the plasma to drive the oxidation is found, specifically at col. 58, line 22 - 55, relied upon by the Examiner as a teaching of "inductive coupled plasma oxidation" (p. 3 of the Office Action).

The Examiner also suggests that "oxidizing the sample and converting it to carbon dioxide where it can then be measured" is taught at col. 61, line 33 - col. 62, line 32. At col. 61, line 35 the statement is indeed made that "almost all organic compounds can be converted easily into CO<sub>2</sub>", but this does not suggest that the oxidation is to be driven by heating from a plasma. Indeed, that sentence continues "[so that] excitation of CO<sub>2</sub> by active N<sub>2</sub> allows highly sensitive detection for organic compounds in general" - that is, nitrogen that is highly excited in an arc is to be mixed with CO<sub>2</sub> from some preexisting source to cause the CO<sub>2</sub> to become excited and emit IR for analysis. Similarly, "[a] pure oxygen arc was also investigated because of its potential for converting organic compounds to CO<sub>2</sub>" (col. 62, lines 28 - 30), and further use of an arc for oxidation is discussed by Busch at col. 63, lines 38 - 40. Neither suggests

employment of the plasma itself to drive the oxidation, as claimed.

The specific advantage provided by use of the plasma to oxidize the TOC is that if the preferred low-temperature non-equilibrium plasma is used (a similar plasma is indeed described by Busch at col. 58, lines 40 - 46, but not for this purpose) the CO<sub>2</sub> is not so hot that it cannot be conveniently handled for further analysis.

Claim 1 has been amended to recite explicitly that TOC in the water sample to be measured is oxidized in response to supply of an oxidant gas and exposure to a plasma; claim 17 has accordingly been canceled. Claim 32 already included this limitation. Hence it is respectfully submitted that these as well as claim 18 distinguish clearly over Busch and that all claims should be allowed.

Busch also fails to show the "sample loop" described in applicants' specification at page 13 and claimed in claim 25, and the second liquid loop, also described at page 13, and claimed in claim 26. These are also found in apparatus claims 15 and 16, respectively. Busch also fails to show the method of analyzing TIC which is the subject of claim 28. The Examiner has not made reference to any teaching of Busch or any other art relevant to these claims, and it is submitted that they include allowable subject matter. Substantial advantages provided by the provision of these loops are discussed at pages 13 and 14 of the application as filed.

Finally, it is noted that the Office Action did not acknowledge receipt of the first Information Disclosure Statement filed December 26, 2001. A second copy is enclosed for the convenience of the examiner, who is respectfully requested to indicate his consideration of the documents thus made of record.

Therefore it is respectfully submitted that all claims

distinguish over the Busch reference, that no modification thereto is suggested by the art of record that would meet applicants' claims, and that they should accordingly be allowed. An early Notice to that effect is earnestly solicited.

Respectfully submitted,

3/22/04  
Dated



Michael de Angeli  
Reg. No. 27,869  
60 Intrepid Lane  
Jamestown, RI 02835  
401-423-3190